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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/802,150	03/17/2004	Keun-Hee Bai	8021-215 (SS-19582-US)	3946

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EXAMINER	
RAYMOND, BRITTANY L	
ART UNIT	PAPER NUMBER
1756	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/17/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/802,150	BAI ET AL.	
	Examiner	Art Unit	
	Brittany Raymond	1756	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *17 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *6/20/2005/11/07/2005*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 2, 4-8, 21, 23, and 25 are rejected under 35 U.S.C. 102(e) as being anticipated by Lindley (U.S. Patent 6326307).

Lindley discloses an etching process comprising: providing a substrate with several metallization layers (Column 1, Lines 13-14), placing a photoresist layer on top of the oxide layer and patterning it to form a mask for etching (Column 4, Lines 62-64), treating the substrate with a fluorocarbon plasma, as recited in claims 6 and 25 of the present invention, for treatment of the photoresist layer and etching of the metallization layers (Column 3, Lines 53-57), as recited in claim 1 of the present invention. Since the layers are being exposed to fluorocarbon plasma during the etching process, this means that fluorine radicals are present during etching, as recited in claim 5 of the present invention. Lindley discloses that silicon dioxide is typically used as one of the metallization layers being etched (Column 1, Line15-16), as recited in claim 4 of the present invention. Lindley states that a polymer layer is formed over the top of the photoresist layer and the photoresist sidewalls during the fluorocarbon treatment (Column 3, Lines 55-56), as recited in claim 21 of the present invention. Lindley also states that carbon monoxide gas can be present during the plasma treatment (Column

8, Line 22), as recited in claims 2 and 23 of the present invention. Finally, Lindley discloses that the main etch is performed in the same reactor as the photoresist pretreatment, without extinguishing the plasma between the two steps (Column 5, Lines 49-51), as recited in claim 7 of the present invention. Lindley states that in this type of etch reactor, RF bias power is coupled to a pedestal electrode supporting the wafer to be etched (Column 5, Lines 8-10), which is taken to mean that power is supplied to the bottom of the wafer, as recited in claim 8 of the present invention. Lindley also states that the RF power increases when transitioning between photoresist pretreatment and the etching process (Column 5, Lines 53-55), as recited in claim 8 of the present invention.

Lindley teaches every limitation of claims 1, 2, 4-8, 21, 23, and 25 and thus anticipates the claims.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 9, 10, 12, 13, and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lindley (U.S. Patent 6326307) in view of Gabriel (U.S. Patent 6103457).

The teachings of Lindley have been discussed in paragraph 2 above.

Lindley fails to disclose that plasma used for the photoresist treatment is formed using a fluorine-free carbon-containing gas.

Gabriel discloses an etch process comprising: providing a substrate and oxide layer (Column 4, Line 1), placing a metallization layer over the oxide layer (Column 4, Line 4), forming a photoresist layer over the metallization layer and patterning the photoresist to form a photomask for etching (Column 4, Lines 8-15), and exposing the layers to a fluorocarbon plasma for forming a polymer layer over the photoresist layer to resist etching and for etching of the metallization layer (Column 4, Lines 30-36). Gabriel states that a carbon-based plasma may be used in the process instead of a fluorocarbon plasma (Column 4, Lines 53-54), as recited in claims 9, 12, and 22 of the present invention.

It would have been obvious to one of ordinary skill in this art, at the time of invention by applicant, to have used a fluorine-free carbon-containing gas, as suggested by Gabriel, in the process of Lindley because Gabriel teaches that this type of gas can create a plasma that works just as well as the fluorocarbon plasma, at protecting the photoresist layer against etching.

5. Claims 3, 11, 14, and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lindley (U.S. Patent 6326307) and Gabriel (U.S. Patent 6103457) in view of Ko (U.S. Patent Application 2003/0129816).

The teachings of Lindley and Gabriel have been discussed in paragraphs 2 and 4 above.

Lindley and Gabriel fail to disclose that the plasma used in the treatment and etching processes can be generated by carbon dioxide.

Ko discloses a process for increasing silicon-containing photoresist selectivity comprising: providing a substrate with a photoresist placed on top, exposing the photoresist to a light source for patterning (Paragraph 0026), eventually curing the photoresist layer with a plasma, which may be formed by carbon dioxide or carbon monoxide gas (Paragraph 0037), and etching the substrate in an etch chamber (Paragraph 0037).

It would have been obvious to one of ordinary skill in this art, at the time of invention by applicant, to have used carbon dioxide to generate a plasma, as suggested by Ko, in the process of Lindley and Gabriel because Ko teaches that carbon dioxide works similarly to carbon monoxide to harden a layer of photoresist so that the photoresist layer is protected against etching.

6. Claims 15-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lindley (U.S. Patent 6326307) in view of Gabriel (U.S. Patent 6103457) as applied to claims 9, 10, 12, 13, and 22 above, and further in view of Ma (U.S. Patent 6830877).

The teachings of Lindley and Gabriel have been discussed in paragraphs 2 and 4 above. Lindley also teaches that the photoresist is stripped by ashing after the etching process is complete (Column 4, Lines 55-57), as recited in claim 15 of the present invention and that conventional photoresist processing is used (Column 4, Lines 60-64), which includes photoresists requiring a 193 nm light source.

Lindley and Gabriel fail to disclose that the photoresist pattern was formed by an ArF light source.

Ma discloses a method for forming via and contact holes with a photoresist comprising imaging a photoresist material using an argon fluoride laser source since a 193 nm source is required (Column 2, Lines 7-11), as recited in claim 15 of the present invention.

It would have been obvious to one of ordinary skill in this art, at the time of invention by applicant, without undue experimentation to have used an argon fluoride laser source, as suggested by Ma, in the photoresist patterning process of Lindley and Gabriel because the exposure conditions for a photoresist are dependent on the specific photoresist used in the process.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brittany Raymond whose telephone number is 571-272-6545. The examiner can normally be reached on Monday through Friday, 8:00 a.m. - 4:30 p.m. EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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KATHLEEN DUDA
PRIMARY EXAMINER
GROUP 1700